

ACCESSION #: 9502140152
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Dresden Nuclear Power Station, Unit 3 PAGE: 1 OF 9

DOCKET NUMBER: 05000249

TITLE: Unit 3 Scram From Main Turbine Stop Valve Closure Due to
Moisture Separator Level High High
EVENT DATE: 01/09/95 LER #: 95-001-00 REPORT DATE: 01/30/95

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 089

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SN COMPONENT: LC MANUFACTURER: F130
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED:

ABSTRACT:

On January 9, 1995, at 1833 hours, with Unit 3 at 89% rated core thermal power, while performing Dresden Operating Procedure (DOP) 3500-03, Removing High Pressure Feedwater Heaters From Service in preparation for replacement of the 3D1 high pressure feedwater heater level switch, the Main Turbine tripped on the 3B Moisture Separator level high high. The Main Turbine trip caused the Unit 3 Reactor to scram on Turbine Stop Valve closure. The 3A Moisture Separator Drain Tank (MSDT) emergency drain valves (3-3510A and 3-3510B) failed to open when required due to the drain valves' controller being out of calibration. In addition, previous similar events provided opportunities to identify the potential for failure but were not recognized in a timely manner. The 3A MSDT emergency drain valves were inspected, their controllers were refurbished, calibrated, and the entire control loop was tested. Development of a preventive maintenance program for critical feedwater heating components is being performed. Safety significance of this event

is considered minimal, all safety systems were operational but were not required during this event.

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END OF ABSTRACT

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EVENT IDENTIFICATION:

Unit 3 Scram From Main Turbine Stop Valve Closure Due to Moisture Separator Level High High

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: 01/09/95 Event Time: 1833 hours

Reactor Mode: Run Mode Name: Run Power Level: 89%

Reactor Coolant System Pressure: 987 psig

B. DESCRIPTION OF EVENT:

On January 7, 1995, while performing Dresden operating Surveillance (DOS) 5600-02, Weekly Turbine Testing, a loss of feedwater heater strings [SN] was experienced (see previous occurrence section). Upon investigation, it was determined that the 3D1 high pressure feedwater heater level switch had failed and would need to be replaced. The 3D1 high pressure feedwater heater was isolated and repair of the switch was given a high priority. Replacement of the switch was important because a feedwater tracer test planned for the following week would provide more accurate data with all three feedwater heater strings on line, which is the normal configuration.

In order to replace the 3D1 high pressure feedwater heater level switch, the 3D2 and 3D3 high pressure feedwater heaters needed to be removed from service. (Refer to the attached sketch for heater layout information.) Removal of the 3D2 and 3D3 high pressure feedwater heaters from service and the 3D1 high pressure feedwater heater level switch replacement were scheduled for the afternoon shift on January 9, 1995.

On January 9, 1995, prior to performing Dresden Operating Procedure (DOP) 3500-03, Removing High Pressure Feedwater Heaters From Service, a Heightened Level of Awareness Briefing (HLA) was

performed for the evolution in accordance with Dresden Administrative Procedure (DAP) 7-37, Conduct of Heightened Level of Awareness Activities and High Impact Activities. The HLA addressed: the responsibilities of the individuals involved, the potential heater trips as they related to reactivity management, the biasing open of the 3D3 high pressure feedwater heater emergency drain valve (spill), the biasing open of the 3A and 3B Moisture Separator Drain Tank (MSDT) emergency drain valves (spill) upon completion of the heater isolation, verified DOP 3500-03 could be used as written, reviewed Dresden Operating Abnormal Procedure (DOA) 3500-02, Loss of Feedwater Heaters, as well as other actions and responses that were to be expected. The potential for the high pressure feedwater heaters to trip was verbalized, but the resultant effect on the system drains and Main Turbine were not. However, these potential consequences of a high pressure feedwater heater or Main Turbine trip were known to the crew. In addition, the presence of a field maintenance request tag (2-part tag) on the 3A MSDT spill valves' (3-3510A & 3-3510B) controller (identifying the 3-3510A spill valve failed to open on a 3A MSDT high level), was not known to the crew during the HLA.

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Upon completion of the HLA, the Shift Supervisor (in the field) was directed by an Instrument Maintenance (IM) Supervisor as to which controls on the field controllers needed to be adjusted to bias the 3D3 high pressure feedwater heater spill valve (3-3507C) and the 3A and 3B MSDTs spill valves (3-3510A, 3-3510B, 3-3511A, and 3-3511B) open. Upon opening the 3A MSDT spill valves' controller box for valves 3-3510A and 3-3510B, a 2-part tag was attached and in clear view. However, the 2-part tag did not mentally register with the Shift Supervisor as they opened the controller.

One member in the crew read the 2-part tag on the 3A MSDT spill valves' controller, (after the HLA but prior to the evolution) but did not realize the potential impact on the evolution and did not report it to other members of the crew. In addition, the IM Supervisor was aware of the 2-part tag but did not mention it because he believed the 3A MSDT spill valves (3-3510A and 3-3510B) were operating based on previous experience with the spills and that he believed the Operations crew was already cognizant of the tag.

The Operators and Shift Manager then biased the 3D3 high pressure feedwater heater spill valve (3-3507C) open in accordance with DAP

3-08, Caution Cards and Caution Stickers, and contacted the Unit 3 Nuclear Station Operator (NSO) to slowly begin removing the 3D2 high pressure feedwater heater from service in accordance with DOP 3500-03.

Upon completing the isolation of the 3D2 high pressure feedwater heater extraction steam, the 3D2 high pressure feedwater heater, unexpectedly to the crew, automatically isolated the 3A and 3B MSDTs drain valves (3-3508B and 3-3509B) on high level. Isolating the steam to the 3D2 high pressure feedwater heater removed the driving force pushing the water through the drain, resulting in a high level in the 3D2 high pressure feedwater heater and the 3A and 3B MSDTs normal drain path isolation (this was not understood by the crew before they isolated the extraction steam to the heater). After the 3D2 high pressure feedwater heater was isolated, the only remaining normal drain path for the 3A and 3B MSDTB was through the 3D3 high pressure feedwater heater.

The resulting increase in drainage to the 3D3 high pressure feedwater heater caused its level to increase and a high level alarm was received in the Control Room (CR) [NA] at 1822 hours. With the level in the 3D3 high pressure feedwater heater high and all the normal MSDT drains isolated, no normal drain paths for the 3A and 3B MSDTs remained (3D1 was isolated on January 7, 1995). The Unit 3 NSO took control of the 3D3 high pressure feedwater heater extraction valve for the 3D3 high pressure feedwater heater and closed it slowly, to reduce input into the heater and to reduce the possibility of water induction into the turbine.

The 3A MSDT high level alarm was received in the CR, the 3-3511A and 3-3511B spills opened as designed and provided a drain path for the B MSDT. However, the 3-3510A and 3-3510B spills for the 3A MSDT failed to open, causing the water level to rise into the 3A and 3B MS. At 1830 and 1831, high level alarms were received in the control room for the 3A and 3B MS (which drain to the 3A MSDT). At 1832 a high high 3B MS alarm was received in the CR and the Main Turbine [TA] tripped resulting in a scram of unit 3, at 1833 hours, from 89% rated core thermal power, on Turbine Stop Valve [JJ] closure. All equipment functioned as expected, except for the Reactor level [JB] rising to a maximum 57.6 inches and

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a perception by personnel that the Auxiliary Power System [EA] fast

bus transfer was slow.

CR personnel perceived that the Auxiliary Power System fast bus transfer took longer than experienced in previous scrams. This perception was based on the flickering of the CR lights and the transfer of the Instrument Bus (EE) to the reserve power feed. Engineering reviewed this concern and found by testing that the timing of the 4kv fast bus transfer was within specifications and that the Instrument Bus transfer switch performed as expected.

The Condensate/Condensate Booster Pump 3D [SD] received a coincidental start signal at the same time as the Auxiliary Power System recovered from the Fast Bus Transfer. The start of the 3D pump caused the voltage to drop on the Reserve Auxiliary Transformer (RAT) winding X for a period of time while the pump came up to speed. The voltage sag, due to the pump ramp up time, was seen by all loads connected to that transformer winding. These loads include the CR lighting and the Instrument Bus. The voltage sag lasted long enough to actuate the Instrument Bus transfer to its reserve supply. When sufficient voltage was re-established at the main feed, the Instrument Bus transferred back to the main feed. The response of the Auxiliary Power System fast bus transfer occurred within specifications. However, the RAT voltage tap will be adjusted to increase voltage. The increased voltage level will allow motors to accelerate faster, thus reducing the voltage sag duration.

Following the reactor scram, reactor water level increased to a maximum of 57.6 inches. The increase Of the water level was attributed to one Feedwater Regulating Valve (FRV) being operated in the automatic mode and the other FRV in manual.

During the initial level increase, the operator took manual action to control reactor water level by tripping off the 3C Reactor Feedwater (RFW) pump and closing the FRVs. At approximately 40 inches of reactor water level, the FRVs indicated full closed. Reactor water level continued to increase due to CRD input to the vessel and leakage past the FRV. As reactor water level continued to increase, the 3A RFW pump tripped at approximately 51.4 inches (within expected accuracies of the Yarway level switches) and level eventually peaked at 57.6 inches.

On May 29, 1988, the Unit 2 Main Turbine Tripped on a 2C Moisture Separator high high level signal. No Reactor scram occurred because the Unit was at 23% rated core thermal power. The MSDT control valves were found in the closed position due to failure of the level

controller. The controller was repaired and the system operated satisfactorily. No further action was deemed necessary at the time because there had not been a recurring event. However, those actions were not sufficient to prevent the occurrence on Unit 3.

C. CAUSE OF EVENT:

This report is being submitted in accordance with 10CFR50.73(a)(2)(iv), which requires reporting of any event that results in unplanned manual or automatic actuation of any engineered safety feature, including the reactor Protection System.

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Root Cause:

1. The 3A MSDT emergency spill valves (3-3510A and 3-3510B) failed to open as required.
2. The preparatory/decision making process used by the System Engineering and Operations departments failed to prevent the occurrence of the event. These instances are outlined in the contributing cause section, below.

Contributing Causes:

1. The System Engineer failed to identify the significance of the failed 3A MSDT spill valve 3-3510A, during the previous event on December 1, 1994, and that both 3A MSDT spill valves (3-3510A and 3-3510B) failed to function as required on January 7, 1995, (refer to previous occurrences for more information) due to perceived time pressure to prepare for the feedwater tracer test. In addition, Engineering Management did not provide the System Engineer with sufficient time and resources to review the January 7, 1995, event due to perceived time pressure to fix the 3D1 high pressure feedwater heater level switch in preparation for the feedwater tracer test.
2. Lack of a questioning attitude by Operations and IM Supervisor in that the 2-part tag on the 3A MSDT spill valves' controller and its Possible effect on the planned evolution was not questioned.
3. The HLA briefing focused on reactivity management concerns if

the heaters were to trip. The possible affects on the plant (i.e. drain paths, turbine trip and unit scram) were not fully verbalized.

4. Although significant work was performed on feedwater heater components during the previous refuel outage, the 3A MSDT spill valves' controller problems were not identified. A preventive maintenance (PM) program for critical feedwater heating components is needed to prevent future events of this type.

5. The Operations crew was not aware of the system impairment (e.g., 2-part tag) during the HLA.

D. SAFETY ANALYSIS:

The safety significance of this event was minimal. All systems operated as expected, except for the Reactor level rising to a maximum 57.6 inches and the transfer of the Instrument Bus to the reserve power feed.

The Reactor level response was reviewed and found to be within expected bands of system performance with one FRV in the manual mode.

The Instrument Bus transfer Was also reviewed and found to be of minimal safety significance.

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E. CORRECTIVE ACTIONS:

Nuclear Tracking System (NTS) tracking code numbers are identified as (XXX-XXX-XX-XXXXX).

1. The 3A MSDT spill valves (3-3510A and 3-3510B) were inspected, their controllers were refurbished, calibrated, and the entire control loop was tested prior to startup.

2. The performance of spill valves of a similar type were evaluated and their reliable operation was ensured prior to startup.

3. System Engineering will develop a preventive maintenance program for critical feedwater heating components. (NTS

0249-180-95-00101)

4. The appropriate Engineering Department individuals were counseled.

5. This event was presented to the System Engineering Department during tailgate as an example of how not to let perceived time pressure result in substandard preparation which can cause an inadvertent reactor scram or other plant transients.

6. An additional review of the feedwater heater Sequence of Events Recorder (SER) [IQ] print-outs for the December 1, 1994, and January 7, 1995, events to identify any other Possible feedwater heater problems was conducted, no problems were identified.

7. A "stop-work" process will be formalized for the System Engineering Department to reinforce that they can stop work anytime they perceive activities are moving to fast. (NTS #249-180-95-00102)

8. The appropriate Operation and IM department individuals were counseled on the importance of a questioning attitude. These counselling sessions reviewed Management expectations concerning investigation of system impairments (such as maintenance request 2-part tags) prior to performing evolutions of this type. The individuals involved acknowledge that their action was deficient in this case, and have amended their work practice.

9. This event was discussed with the Operating department to stress the importance of having a questioning attitude even during planned plant evolutions.

10. This event was included in the Operations Department required reading book.

11. This event was reviewed with IM Department personnel, stressing the importance of having a questioning attitude even during planned plant evolutions.

12. The Operations Department re-enforced to its personnel that relevant possible results/consequences need to be verbalized during HLA/HI briefing. In addition, a discussion of system impairments needs to be performed during the HLA/HI briefing.

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13. The Operations Manager will revise the HLA/HI procedure (DAP 7-37) for any needed improvements concerning knowledge of system impairments. (NTS #249-180-95-00103)

14. The Operations Manager will determine methods to improve Operators Plant status knowledge. (NTS #249-180-95-00104)

15. The RAT voltage tap will be adjusted to increase voltage. The increased voltage level will allow motors to accelerate faster, thus reducing the voltage sag duration. (NTS #249-180-95-00105)

F. PREVIOUS OCCURRENCES:

1. On December 1, 1994, a similar feedwater heater event occurred on Unit 3 that did not result in a turbine trip or a reactor scram. At 0242 hours a 3A MSDT level high alarm was received in the CR. It is expected that the 3A MSDT spill valves, 3-3510A & 3-3510B, would open prior to receiving this alarm. Nine and ten seconds after the first 3A MSDT alarm, the 3B MSDT spill valves, 3-3511A & 3-3511B, opened sequentially per design. As a consequence of the spills opening, the 3B MSDT high alarm was not reached due to level being controlled in the 3B MSDT. By 0307 and 0308 hours, the 3B MS high level and 3A MS high level alarms were received due to the water level backing up from the flooded 3A MSDT. At 0318 hours, valve 3-3510B opened. At 0320 hours, the 3A MS & 3B MS high level alarms cleared. At 0324 hours, the spill valve 3-3510B closed and the 3A MSDT high level alarm cleared, ending the transient of 3A MSDT level.

A work request was written (WR D28914) to investigate the unexpected spill valve response. This WR was given a B-63 priority (to be worked during a Unit 3 forced outage) because the significance of the erratic operation of the 3A MSDT spill valves was not realized by Operations. A review of the event data by the System Engineer also failed to identify the significance of the erratic operation of the 3A MSDT spill valves (3-3510A and 3-3510B). No License Event Report (LER) was required, however, a Problem Identification Form (PIF) was generated, NTS number 249-200-94-12500.

2. On January 7, 1995, a similar feedwater heater event occurred on Unit 3 that did not result in a turbine trip or a reactor scram. The 3D1 high pressure heater high level switch failed. The failure was identified during the normal turbine weekly surveillance (DOS 5600-02) when a feedwater transient occurred after completing testing on CIV number 1. A loss of a feedwater heater strings was experienced. During the heater perturbations, the 3A and 3B MS went high. Only the 3B MSDT spill valves operated (3-3511A & 3-3511B). The 3A MSDT spill valves (3-3510A & 3-3510B) did not operate as expected, but normal MS level was quickly established. Since the 3D1 heater level switch was not functioning, the 3D1 high pressure feedwater heater did not isolate, and the 3A MSDT was able to drain through the 3D1 heater.

The system engineer review of this event did not recognize the failure of the 3A MSDT spill valves (3-3510A and 3-3510B) as further evidence that the valves identified on December 1 (above) was in a degraded condition. If he had recognized the relationship to the December event he would have

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increased the priority of the WR to repair the 3A MSDT spill valves' function. No LER was required, however a PIF was generated, NTS number 249-200-95-00200.

3. On May 29, 1988, the Unit 2 Main Turbine Tripped an a 2C Moisture Separator high high level signal. No Reactor scram occurred because the Unit was at 23% rated core thermal power. The MSDT control valves were found in the closed position due to failure of the level controller. The controller was repaired and the system operated satisfactorily. No further action was deemed necessary at the time because there had not been a recurring trend. However, as evidenced by the above occurrences, a preventive maintenance program needs to be implemented. This event was documented under Deviation Report (DVR) 12-2-88-072 NTS #237-180-88-0720.

G. COMPONENT FAILURE DATA:

Fisher Level Controller, Model No. 2506R.

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Figure "EXTRACTION STEAM VALVES NOT SHOWN FOR CLARITY" omitted.

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ATTACHMENT TO 9502140152 PAGE 1 OF 1

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February 3, 1995

TPJLTR: 95-0018

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Licensee Event Report 95-001, Docket 50-249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10CFR50.73(a)(2)(iv).

Sincerely,

Thomas P. Joyce
Site Vice President

TPJ/PKG:cfq

Enclosure

cc: J. Martin, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

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